

Appl. No. 10/826,059
Reply to Office Action of June 15, 2006

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-3 (canceled).

Claim 4 (Currently Amended): An active ray curable ink-jet ink composition comprising:

a photo-induced acid generating agent containing an onium salt which does not generate benzene during active ray radiation, and

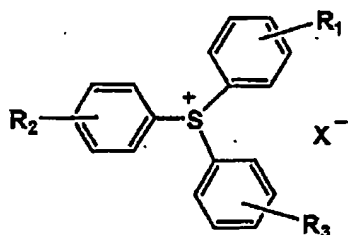
a photopolymerizable compound containing a compound having an oxetane ring in the molecule,

wherein the onium salt is a sulfonium salt represented by one of Formulas (1) to (4):

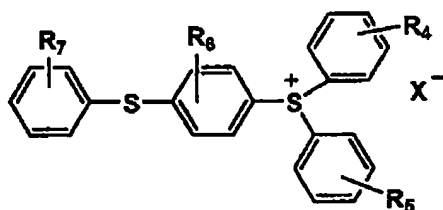
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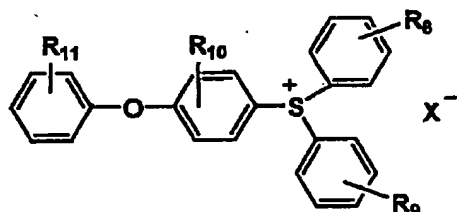
Formula (1)



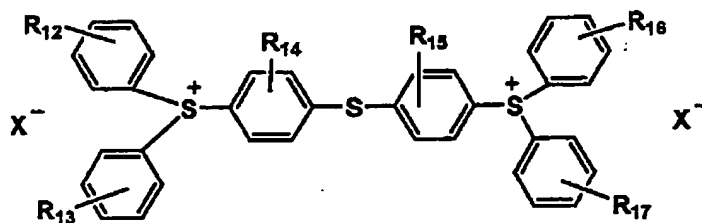
Formula (2)



Formula (3)



Formula (4)



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wherein R_1 - R_{17} are ~~[[each]]~~ individually selected from the group consisting of a hydrogen atom; an alkyl group selected from the group consisting of a methyl group, ethyl group, propyl group, isopropyl group, butyl group, isobutyl group, t-butyl group, pentyl group, and hexyl group; an alkoxy group selected from the group consisting of a methoxy group, ethoxy group, propoxy group, butoxy group, hexyloxy group, decyloxy group, and dodecyloxy group; a carbonyl group selected from the group consisting of a acetoxy group, propionyloxy group, decylcarbonyloxy group, dodecylcarbonyloxy group, methoxycarbonyl group, ethoxycarbonyl group, and benzoyloxy group; a halogen atom selected from the group consisting of fluorine, chlorine, bromine and iodine; a cyano group, a nitro group, or a hydroxyl group or a substituent group, provided that R_1 - R_3 are not a hydrogen atom at the same time, at least one of R_1 - R_3 is an alkoxy group or all are each a methyl, R_4 - R_7 are not a hydrogen atom at the time, R_8 - R_{11} are not a hydrogen atom the same time, R_{12} - R_{17} are not a hydrogen atom at the same time; X is a non-nucleophilic anion residue; and R_1 - R_3 of Formula (1) are not a phenylthio group or a phenoxy group.

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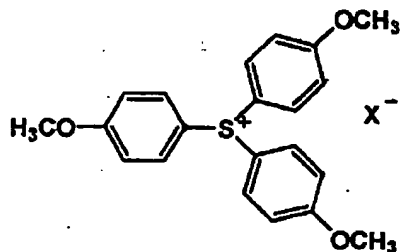
Claim 5 (Currently Amended): An active ray curable ink-jet ink composition comprising:

a photo-induced acid generating agent containing an onium salt which does not generate benzene during active ray radiation, and

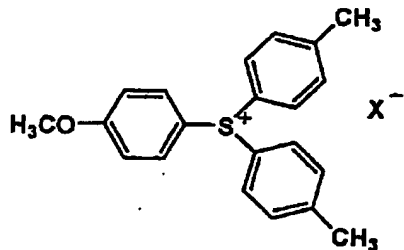
a photopolymerizable compound containing a compound having an oxetane ring in the molecule. ~~The active ray curable ink-jet ink composition according to claim 4,~~

wherein the sulfonium salt represented by one of Formulas (1) - (4) is represented by one of Formulas (5) - (13):

Formula (5)



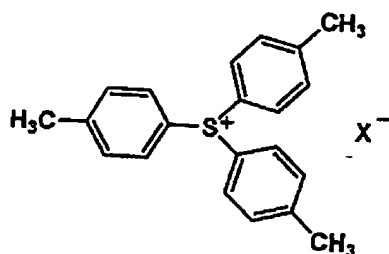
Formula (6)



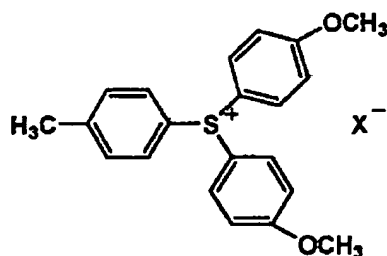
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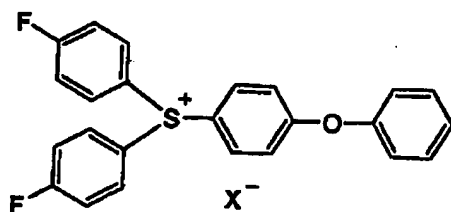
Formula (7).



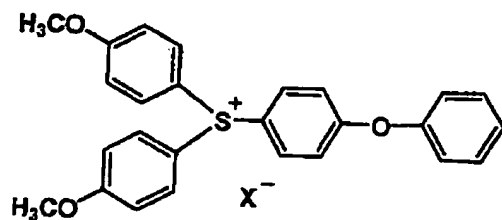
Formula (8)



Formula (9)

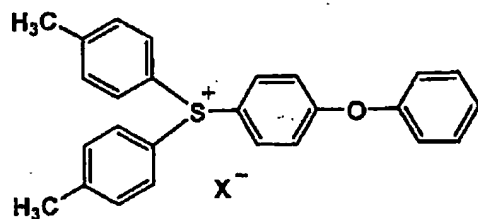


Formula (10)

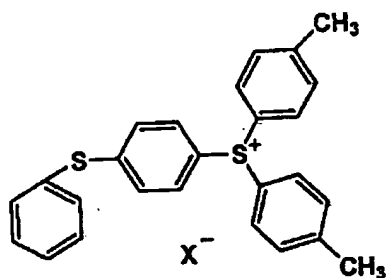


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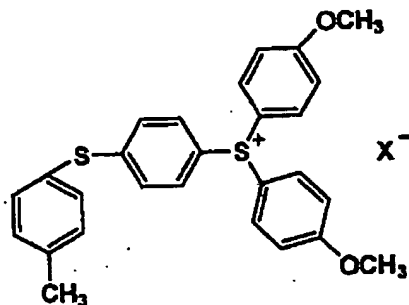
Formula (11)



Formula (12)



Formula (13)



wherein X in each Formula is a ~~non-nucleophilic~~
non-nucleophilic anionic group.

Claim 6 (Currently Amended): The active ray curable ink-jet ink composition according to ~~claim 1~~ claim 5, comprising a basic compound.

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Claim 7 (Currently Amended): The active ray curable ink-jet ink composition according to ~~claim 1~~ claim 5, comprising a nonionic surface active agent.

Claim 8 (Currently Amended): The active ray curable ink-jet ink composition according to ~~claim 1~~ claim 5, comprising a photopolymerizable compound having an oxirane group in the molecule.

Claim 9 (Currently Amended): The active ray curable ink-jet ink composition according to ~~claim 1~~ claim 5, comprising the following photopolymerizable compounds:

- (a) a compound having at least one oxetane ring in the molecule in an amount of 25 - 90 weight%;
- (b) a compound having at least one oxirane group in the molecule in an amount of 10 - 70 weight%; and
- (c) a vinyl ether compound in an amount of 0 - 40 weight%,

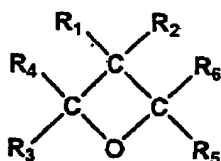
each weight% is based on the total weight of the composition.

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Claim 10 (Currently Amended): The active ray curable ink-jet ink composition according to ~~claim 1~~ claim 5, wherein the compound which has an oxetane ring represented by Formula (E) :

Formula (E)



~~Wherein~~ wherein R₁ - R₆ are each a hydrogen atom or a substituent group, provided that at least one group represented by R₃ - R₆ is said [[a]] substituent group wherein said substituent group is selected from the group consisting of a halogen atom; a group linked with an aliphatic group, an aromatic group, or a heterocyclic group, through at least one linking group selected from O, S, an NH group, a COO group, an OCO group, and an SO₂ group; an aliphatic group; an aromatic group; or a heterocyclic group; and further R₁ - R₆ may form a polyfunctional oxetane compound linked with an atom group containing another oxetane ring, through a divalent hydrocarbon radical which may contain O, S, or Si in a principal chain.

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Claim 11 (Currently Amended): The active ray curable ink-jet ink composition according to ~~claim 1~~ claim 5, exhibits a viscosity of 7 - 50 mPa•s at 25 °C.

Claim 12 (Withdrawn-Currently Amended): An image forming method using the active ray-curable ink-jet ink composition of ~~claim 1~~ claim 4, comprising the steps of:

- (a) ejecting droplets of the ink from a nozzle an ink-jet recording head to form an image on a recording material; and
- (b) irradiating the image with an active ray, wherein the irradiation step is carried out between 0.001 - 2.0 seconds after deposition of the ink composition.

Claim 13 (Withdrawn): The image forming method according to claim 12,

wherein the total ink thickness on the recording material is 2 - 20 µm after irradiation of an active ray.

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Claim 14 (Withdrawn): The image forming method according to claim 12,

wherein the ink droplet volume ejected from each nozzle of the ink-jet recording head is 2 to 15 pl.

Claim 15 (Withdrawn): The image forming method according to claim 12,

wherein the ink-jet recording head is a line head.

Claim 16 (Withdrawn): An ink-jet recording apparatus which is employed in the image forming method according to claim 12,

wherein an active ray curable ink-jet ink composition and an ink-jet recording head are heated to 35 - 100 °C before ejecting the ink composition.

Claims 17-25 (Canceled).

Claim 26 (New): The active ray curable ink-jet ink composition according to claim 4, comprising a basic compound.

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Claim 27 (New): The active ray curable ink-jet ink composition according to claim 4, comprising a nonionic surface active agent.

Claim 28 (New): The active ray curable ink-jet ink composition according to claim 4, comprising a photopolymerizable compound having an oxirane group in the molecule.

Claim 29 (New): The active ray curable ink-jet ink composition according to claim 4, comprising the following photopolymerizable compounds:

- (a) a compound having at least one oxetane ring in the molecule in an amount of 25 - 90 weight%;
- (b) a compound having at least one oxirane group in the molecule in an amount of 10 - 70 weight%; and
- (c) a vinyl ether compound in an amount of 0 - 40 weight%,

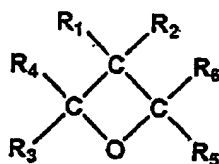
each weight% is based on the total weight of the composition.

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Claim 30 (New): The active ray curable ink-jet ink composition according to claim 4,

wherein the compound which has an oxetane ring represented by Formula (E) :

Formula (E)



wherein R₁ - R₆ are each a hydrogen atom or a substituent group, provided that at least one group represented by R₃ - R₆ is said substituent group wherein said substituent group is selected from the group consisting of a halogen atom; a group linked with an aliphatic group, an aromatic group, or a heterocyclic group, through at least one linking group selected from O, S, an NH group, a COO group, an OCO group, and an SO₂ group; an aliphatic group; an aromatic group; or a heterocyclic group; and further R₁ - R₆ may form a polyfunctional oxetane compound linked with an atom group containing another oxetane ring, through a divalent hydrocarbon radical which may contain O, S, or Si in a principal chain.

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Claim 31 (New): The active ray curable ink-jet ink composition according to claim 4, exhibits a viscosity of 7 - 50 mPa•s at 25 °C.